R&D at Barry Callebaut

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BARRY CALLEBAUT

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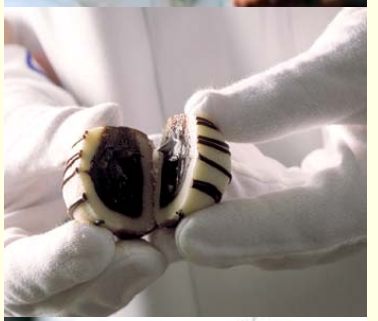
- R&D strategy and focus of product development
- Exploring the health aspects of cocoa polyphenols



R&D at Barry Callebaut

R&D at Barry Callebaut

- **R&D is a key success factor for the successful implementation of our growth strategy.**

- Role of R&D:
  - Help to create growth opportunities:
    - Creation of new products in response to consumers' changing eating habits
    - Development of new applications
  - Help to retain existing customers by offering superior service:
    - New products and applications
    - Technical support and customer training
    - Barry Callebaut Institutes
  - Create cost-saving opportunities:
    - Raw material optimization
    - Process innovation and continuous improvement

R&D at Barry Callebaut

- We have two main pillars in the organization. Fundamental R&D is centralized, whereas Applied R&D is done in the local markets.
  - Global/Regional:
    - 2 centers of excellence for:
      - Fundamental product and process innovation
      - Close cooperation with the Business Units (project selection)
      - Cooperation with Universities and research institutes
  - Local:
    - Day-to-day product development
    - Product management
    - Technical support engineers
    - BC Institutes in the key markets

R&D at Barry Callebaut

- Fundamental product innovation accross the whole Group, interdisciplinary teams under central guidance
  - Same approach for all Business Units
    - Evaluation of key market trends
    - Strategic priorities per Business Unit
    - Product gaps and new product ideas

    → Priority list for the development projects

  - *But different focus*

Cocoa	**Food Manufacturers**	**Gourmet & Specialties**	**Consumer**
Raw Mat. Optim.	Health	Convenience	Health
New applications	Indulgence	Health	Indulgence
	Raw Mat. Optim.		Raw Mat. Optim.

- Process and technology development, central team dealing with global agenda

R&D strategy and focus of product development

R&D: Strategy

- **R&D puts special emphasis on health and health-enhancing aspects.**
- **The three main areas of focus are as follows:**

1. Normal Chocolate:
   - Make an inventory of the natural health benefits of chocolate and cocoa.
   - Use results from the healthy range to support the normal chocolate.

2. Healthy / Functional Range:
   - Develop chocolate and cocoa products where the natural benefits are strengthened (Polyphenols, Stearic Acid, Melanoidines).
   - Work with external specialists to get scientific endorsement.

3. "Guilt-free" or "better for you" Range of Products:
   - Develop chocolate and cocoa products where the undesirable effects of fat and sugar have been reduced or eliminated.

Product development focus: Healthy / Functional products (1)

- Polyphenols and Melanoidines:
  - Properties to be studied:
    - Anti-aging (long term memory, activity levels and concentration).
    - Protection against Cancer.
    - Cardiovascular (blood pressure & cholesterol).
    - Immune system.
  - Products:
    - High polyphenol content dark chocolate (normal and sugar free).
      - Daily consumption; bite size; easy to handle.
    - Cocoa & Chocolate Drinks with high polyphenol content (normal and sugar free).
      - Daily consumption; portion pack; easy to handle.
    - Polyphenol extract.
      - As a food supplement.
      - For cosmetics.

Product development focus: Healthy / Functional products (2)

- Cocoa Butter: Stearic Acids / oleic acids.
  - Properties to be studied (Co-operation with University of Ghent):
    - Blood pressure.
    - Cholesterol.
    - Fewer calories – low calorie absorption.
  - Products:
    - Healthy Mycryo Butter.
      - Bake-stable fat for baking.
      - Gelatine replacement for confectionery.
      - Low calorie version.
    - Oil or fat for baking.
      - E.g. French Fries (no smell, bake-stable).
    - Low calorie chocolate.

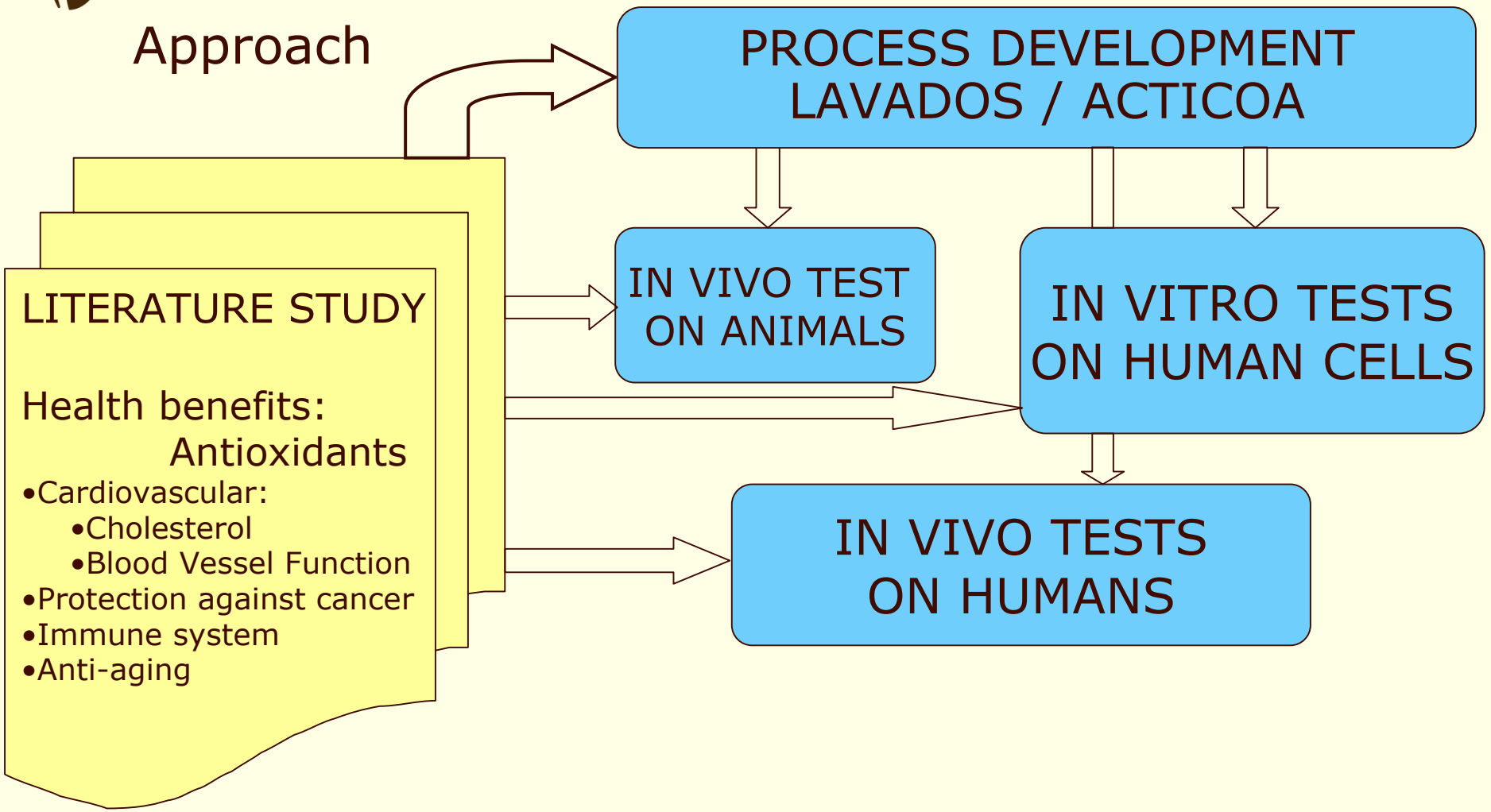
Product development focus: "Guilt-free" or "better for you" products

- Sugar:
  - Properties:
    - Achieve the same taste sensation with less or no sugar.
    - Low Glycaemic index.
    - Low Carbohydrates.
  - Products:
    - Sugar reduced; without added sugar and sugar-free (dark and milk).
    - Full product range.
- Fat / Cocoa Butter:
  - Properties:
    - Achieve the same taste sensation with fewer calories or lower calorie absorption.
    - Low Glycaemic index.
  - Products:
    - Full product range.

Polyphenol studies – a preview of work in progress

Exploring the natural health benefits of cocoa

Approach



In-vitro tests on human cancer cells (1)

- In a lab environment the impact of cocoa polyphenols (compared to Beta-Sitosterol) was tested on:
  - Healthy prostate cells.
  - Local prostate cancer cells.
  - Metastasis prostate cancer cells (migrated cancer cells from the brain)
- Tests were done:
  - In different concentrations.
  - For different contact times.

In-vitro tests on human cancer cells (2)

Conclusions:

- Local prostate cancer cells.
  - IC50 was achieved after 1 hr. for the polyphenol extracts.
  - IC50 only achieved after 48 hrs. for Beta-sitosterol.
- Metastasis prostate cancer cells.
  - IC50 was achieved after 24 hrs. for the polyphenol extracts.
  - IC50 was not achieved for Beta-sitosterol.
- Healthy prostate cells.
  - No impact of the polyphenol extracts before 48 hrs.

In-vivo tests on animals (1)

- Five groups of 15 male rats

Group	Treatment	Dose
Control	-	-
Vehicle	Placebo	-
Chemo-induced vehicle	Placebo	-
Chemo-induced + CPE 24	Cocoa Polyphenols	24 mg/kg, P.O.
Chemo-induced + CPE 48	Cocoa Polyphenols	48 mg/kg, P.O.

- Cognitive tests
  - ALSAT: performed 2, 4, 6 and 8 months after the induction of prostate tumors,
  - Morris water maze: performed 5 and 8 months after the induction of prostate tumors.

In-vivo tests on animals (2)

Conclusions:

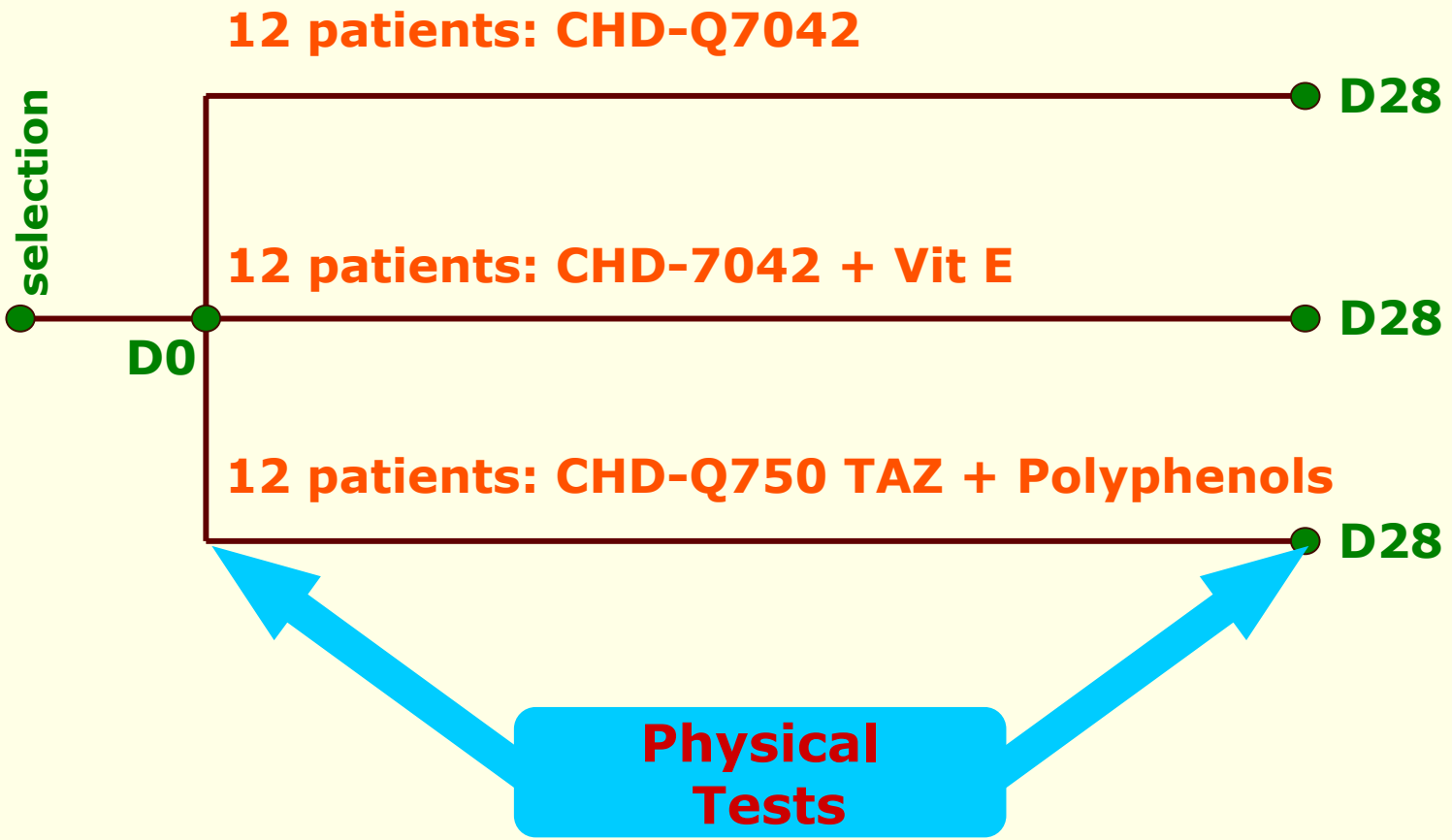
After 12 months the rats induced with cancer cells and treated with polyphenol extract did not have cancer.

- Cocoa polyphenols slow down the effects of aging.
  - Long term memory
  - General activity levels.
  - Concentration.
- Dosage is important.
  - Best results with 24 mg/kg (compared to 48mg/kg).
- Additional results.
  - Treatment of the non-induced rats with polyphenols after 12 months showed a significant positive impact on cognitive results.

In-vivo test on humans

Test Set-up

As simple and exhaustive as possible



In-vivo test on humans

Conclusion:

- The group receiving polyphenol chocolate showed a significant decrease in Malondialdehyde (MDA) after 28 days.
- MDA is an indicator for oxidation reactions.
- This would suggest that less oxidation has occurred in the people that received the polyphenol chocolate.
- Further testing planned.

Next steps in our work in progress

- R&D level
  - Finalizing internal studies.
  - Contacts with university hospitals specialized in cancer treatment and ageing diseases.
  - Tests on humans for specific properties.
    - Project with university hospitals on prostate cancer and cardiovascular diseases.
    - Projects with specialized research centers & universities on Aging & Stress.
  - Foundation of a Scientific Advisory Board

- Product development level
  - Chocolate rich in polyphenol will be launched in Belgium (Apr 05) and in Germany (May 05).
  - Cocoa and Chocolate drinks under development.
  - Further product development and introduction.

Q&A